CLAIMS

What is claimed is:

Claim 1 - An implant for location within an intervertebral space between a pair of adjacent vertebrae, the implant comprising:

a helical spring having a plurality of turns about a center line;

the helical spring adapted to be located with said center line between the two vertebrae; and

at least one of said turns adapted to have a turn height of at least half of a height of the space between the two vertebrae.

Claim 2 - The implant of Claim 1 wherein said center line lies within a center line plane, said center line plane adapted to pass between the two vertebrae when said helical spring is located between the two vertebrae.

Claim 3 - The implant of Claim 2 wherein said center line is substantially linear.

Claim 4 - The implant of Claim 2 wherein said center line is curving.

Claim 5 - The implant of Claim 4 wherein said center line forms a circuit.

Claim 6 - The implant of Claim 5 wherein said center line is circular.

Claim 7 - The implant of Claim 1 wherein said turn height of said at least one turn is substantially similar to a height of the space between the two vertebrae.

Claim 8 - The implant of Claim 1 wherein said helical spring exhibits a substantially toroidal outline.

Claim 9 - The implant of Claim 1 wherein said helical spring exhibits a substantially cylindrical outline.

Claim 10 - The implant of Claim 1 wherein said helical spring exhibits a substantially barrel shaped outline with ends of said helical spring shorter in height than a middle portion of said helical spring.

Claim 11 - The implant of Claim 1 wherein said helical spring is substantially ellipsoidal in outline.

Claim 12 - The implant of Claim 11 wherein said helical spring is shorter than it is wide.

Claim 13 - The implant of Claim 1 wherein said helical spring is substantially frusto-conical in outline with a front end having a height greater than a height of a rear end of said helical spring.

Claim 14 - The implant of Claim 1 wherein said helical spring is formed of a nickel titanium alloy having a martensite phase and an austenite phase, said spring adapted to be elongated along said center line and decreased in diameter away from said center line, and placed within a delivery cannula having a diameter less than said turn height after discharge from the cannula and transition of said helical spring from said martensite phase to said austenite phase.

Claim 15 - The implant of Claim 1 wherein said turns adjacent a middle of said spring have a height greater than turns of said spring adjacent ends of said helical spring.

Claim 16 - The implant of Claim 1 wherein said turns adjacent a front end of said helical spring have a height greater than a height of turns adjacent a rear end of said helical spring.

Claim 17 - The implant of Claim 1 wherein said turns have said turn height less than a turn width, such that a cross-sectional outline of said helical spring is somewhat elliptical.

Claim 18 - The implant of Claim 1 wherein said turns are located abutting each other when said helical spring is at rest.

Claim 19 - The implant of Claim 18 wherein said turns include complemental surfaces to provide some degree of locking when said complemental surfaces abut each other.

Claim 20 - The implant of Claim 19 wherein at least one of said turns includes a tongue extending therefrom and at least one of said turns includes a groove thereon sized to receive said tongue therein.

Claim 21 - The implant of Claim 19 wherein at least one of said turns includes a trough extending therefrom and at least one of said turns includes a crest thereon sized to reside within said trough of an adjacent said turn.

Claim 22 - The implant of Claim 19 wherein at least two of said turns abutting each other include complementally formed mating notches therein.

Claim 23 - A method for delivery of an intervertebral space implant, including the steps of:

removing at least a portion of a nucleus of a disk within the intervertebral space;

locating a delivery cannula with a delivery end adjacent the intervertebral space;

providing an implant within the cannula, the implant including a helical spring having a plurality of turns about a center line, the helical spring adapted to be located with the center line between the two vertebrae; and

advancing the implant out of the cannula and into the intervertebral space with the center line of the implant between the two vertebrae.

Claim 24 - The method of Claim 23 including the further steps of compressing the implant from a larger at rest size to a smaller compressed size, locating the compressed implant within the cannula, and later expanding the implant when the implant is advanced out of the cannula and into the intervertebral space.

Claim 25 - The method of Claim 24 wherein said compressing step includes the step of forming the implant from a nickel titanium material having a softer martensite phase and a harder austenite phase and cooling the implant sufficiently to transition the implant into its martensite phase before compressing the implant according to said compressing step.

Claim 26 - The method of Claim 24 wherein said compressing step includes the step of elongating the implant.

Claim 27 - The method of Claim 23 wherein said providing step includes the step of sizing the implant to have a turn height for at least one of said turns which is at least half

of a height of the intervertebral space.

Claim 28 - The method of Claim 27 wherein said sizing step includes sizing at least one of the turns to have a turn height substantially similar to a height of said intervertebral space.

Claim 29 - The method of Claim 23 wherein said providing step includes shaping the helical spring to exhibit a substantially toroidal outline.

Claim 30 - The method of Claim 23 wherein said providing step includes the step of shaping the helical spring to exhibit a substantially barrel shaped outline with ends shorter than a middle thereof.

Claim 31 - The method of Claim 23 wherein said providing step includes the step of shaping the helical spring to exhibit a substantially ellipsoidal outline.

Claim 32 - The method of Claim 31 wherein said shaping step includes the step of shaping the helical spring to be shorter than it is wide.

Claim 33 - The method of Claim 23 wherein said providing step includes the step of shaping the helical spring to be substantially frusto-conical in outline with a front end having a height greater than a height of a rear end.

Claim 34 - The method of Claim 23 wherein said providing step includes the step of shaping the helical spring to have turns adjacent a middle of the helical spring having a height greater than a height of turns adjacent each end of the helical spring.

Claim 35 - The method of Claim 23 wherein said providing step includes the step of adapting at least two of the turns to be abutting each other and shaped to engage each other along abutting surfaces thereof.

Claim 36 - The method of Claim 23 wherein said advancing step includes the step of rotating the implant within the cannula to advance the implant out of the cannula and into the intervertebral space.

Claim 37 - The method of Claim 23 wherein said advancing step includes the step of sliding the implant out of the cannula and into the intervertebral space.

Claim 38 - A method for delivery of an intervertebral space implant, including the steps of:

removing at least a portion of a nucleus of a disk within the intervertebral space;

locating a delivery cannula with a delivery end adjacent the intervertebral space;

providing an implant within the cannula, the implant having a compressed size at least as small as a size of the cannula and an expanded size greater than a size of the cannula;

advancing the implant out of the cannula and into the intervertebral space; and

transitioning the implant from its compressed size to its expanded size, the expanded size at least half of a height of the intervertebral space.

Claim 39 - The method of Claim 38 including the further step of configuring the implant as a slitted cylinder.

Claim 40 - The method of Claim 39 wherein said configuring step includes the step of overlapping tips of the implant adjacent opposite sides of a slit in the slitted cylinder when the implant is at its compressed size.

Claim 41 - The method of Claim 39 wherein said configuring step includes the step of forming the implant from a nickel titanium alloy having a softer martensite phase and a harder austenite phase with said implant transitioning from said softer martensite phase to said harder austenite phase during said advancing step.

Claim 42 - The method of Claim 38 including the further step of configuring the implant to include a helical spring with a plurality of turns and with said helical spring having the compressed size including the helical spring elongated between ends thereof.

Claim 43 - The method of Claim 38 including the further step of configuring the implant to include a pair of end plates with a shaft therebetween and with a cylinder of resilient material surrounding the shaft and abutting each of the second end plates, and located between the two end plates, the cylinder of resilient material adapted to exhibit radial expansion upon axial compression of the cylindrical resilient material when axially

compressed by the end plates.

Claim 44 - The method of Claim 43 wherein said configuring step includes the cylinder formed of resilient material including a cylindrical outside surface and a generally cylindrical inside surface, the inside surface including a plurality of grooves thereon which become narrower as the cylinder of resilient material is compressed and radially expanded.

Claim 45 - The method of Claim 44 including the further step of cutting off portions of the shaft which are excess after the cylinder of resilient material has been compressed axially and expanded radially.